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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/802,084	03/08/2001	Boon Siew Ooi	774-010234-US(PAR)	5341

2512 7590 04/07/2003

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EXAMINER
COLEMAN, WILLIAM D

ART UNIT	PAPER NUMBER
2823	

DATE MAILED: 04/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/802,084	OOI ET AL.	
	Examiner	Art Unit	
	W. David Coleman	2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *21 January 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Arguments

1. The amendment filed January 21, 2003 in paper no. 9 has been reviewed, however, not very persuasive.

2. Applicants contend the rejection of claims 1, 4, 5, 6, 7, 8 and 9 under 35 U.S.C. § 102(b) is traversed because Applicants allege that Burnham et al., U.S. Patent Re:33,274 does not teach "irradiating...to generate defects..." and "annealing the structure...". Because theses limitations are missing from Burnham.

3. In response to Applicants contention that Burnham fails to teach the limitations of Claim 1, i.e., "irradiating...to generate defects..." and "annealing the structure...". These limitations are clearly disclosed by Burnham. Laser 28 produces a laser beam, Applicants should be aware that a laser beam emits photons which is a form of irradiating. The substrate is heated to improve the selective disorder (columns 3-4, lines 13-65).

4. Applicants contend that at item 4 of the detailed action the xenon lamp 44 as shown in FIG. 2 cannot introduce defects, since no defects are introduced into the quantum well.

5. In response to Applicants contention that Burnham fails to disclose a radiation source selected from a group consisting of electrical gas discharge devices, excimer lasers, synchrotron devices, flash x-ray devices and gamma ray sources. The Examiner indicates that a xenon lamp is an electrical gas discharge device as well as the laser discussed above, and therefore meets the limitations of the claim.

6. Applicant contends that Burnham does not teach the step of masking a portion of the structure to control the degree of radiation damage.

7. In response to Applicants contention that the silicon oxide layer 24 fails to provide a control of radiation damage, Applicants must provide a sworn affidavit for the rejection of claim 5 to be withdrawn.

8. In response to Applicants contention that Burnham fails to teach the structure is masked in a differential manner because the Examiner points to element 60. Please note that pattern layer 60 implies a mask region and therefore Applicants arguments are moot.

9. Applicants further contend that the rejection under 35 U.S.C. § 103 is improper because Burnham does not teach the introduction of point defects in the quantum well region.

10. In response to Applicants contention that Burnham fails to teach the introduction of point defects in the quantum well region, Applicants have not specifically pointed out the failure of Burnham's teaching with regards to Applicants claims.

11. Applicants contend that Burnham and Thompson fails to teach a method according to claim 2. Applicants further contend that the plasma ECR source is not a radiation source for the purpose of the Thompson document.

12. In response to Applicants contention that Thompson fails to teach a radiation source. It is well known in the art that an Electron Cyclotron Resonance device works in the microwave frequency range and is therefore a radiation source. The term radiation is generally accepted as transferring energy through air and/or a vacuum. Furthermore Thompson is pertinent to the Application because Thompson teaches a method of locally modifying the effective bandgap energy of compound semiconducting materials.

13. Applicants contend that the combination of Burnham, Poole and Feldman fails to teach a gray tone mask or a for that matter a photoresist as claimed in claim 10.

14. In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988)and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Poole teaches the use of a shadow masking technique (column 2, lines 55-56). One of ordinary skill in the art would recognize that a shadow mask is merely nothing more than an equivalent to a gray tone mask.

15. Applicants contend that the Double Patenting rejection with US 2002/0072142 should be removed because there is no conflict with explicitly teaching the use of ions as compared to photons.

16. In response to Applicants contention that the introduction of ions in place of photons is explicitly different from the present claimed invention, please note that the references teaches that ions and photons for the adjustment of the bandgap are merely obvious process techniques.

Claim Rejections - 35 USC § 102

17. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

18. Claims 1, 4, 5, 6, 7, 8 and 9 are rejected under 35 U.S.C. 102(b) as being anticipated by Burnham et al., U. S. Patent Re. 33,274.

19. Burnham teaches a semiconductor process as claimed.

Pertaining to claim 1, see **FIGS. 1-5**, where Burnham teaches a method of manufacturing a photonic integrated circuit comprising a compound semiconductor structure having a quantum well region 54, comprising the steps of irradiating the structure using a source of photons (i.e., laser, column 2, lines 1-5) to generate defects, the photons having an energy (E) at least that of the displacement energy ($E_{„}$) of at least one element of the compound semiconductor, and subsequently annealing the structure to promote quantum well intermixing.

20. Pertaining to claim 4, Burnham teaches a method according to claim 1, in which the radiation source is one selected from a group consisting of electrical gas discharge devices **44**, excimer lasers, synchrotron devices, flash x-ray devices and gamma ray sources.

21. Pertaining to claim 5, Burnham teaches a method according to claim 1, including the step of masking a portion **62** (also see claims 4 and 5) of the structure to control the degree of radiation damage.

22. Pertaining to claim 6, Burnham teaches a method according to claim 5, in which the mask is adapted to prevent intermixing entirely.

23. Pertaining to claim 7, Burnham teaches a method according to claim 5, in which the structure is masked in a differential manner to selectively intermix the structure in a spatially controlled manner by controlling the exposure of portions of the structure in a predetermined manner (mask **60**).

24. Pertaining to claim 8, Burnham teaches a method according to claim 5, in which the mask is selected from a group consisting of binary masks, phase masks, gray, masks, dielectric or metal masks, and photoresist masks.

25. Pertaining to claim 9, Burnham teaches a method according to claim 1, in which spatial control of intermixing is controlled using a variable profile mask pattern.

Claim Rejections - 35 USC § 103

26. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

27. Claims 2, 3 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burnham U.S. Patent Re. 33,274 as applied to claims 1, 4, 5, 6, 7, 8 and 9 above, and further in view of Thompson et al., U.S. Patent Application Publication No. US 2002/0127752 A1.

28. Burnham discloses a semiconductor process substantially as claimed as discussed above.

Pertaining to claim 2, Burnham fails to teach a method according to claim 1, in which the radiation source is a plasma. Thompson teaches a method wherein the radiation source is a plasma [0030]. In view of Thompson, it would have been obvious to one of ordinary skill in the art to incorporate the plasma source of Thompson into the Burnham semiconductor process because a first defect layer is grown [0030, lines 17-20].

29. Pertaining to claim 3, Burnham fails to teach a method according to claim 2, in which the plasma source is generated using an electron cyclotron resonance (ECR) system, an inductively coupled plasma (ICP) system, a plasma disk excited by a soft vacuum electron beam, or plasma soft x-ray (SFR) devices. Thompson teaches a method according to claim 2, in which the plasma source is generated using an electron cyclotron resonance (ECR) system, an inductively coupled

plasma (ICP) system, a plasma disk excited by a soft vacuum electron beam, or plasma soft x-ray (SFR) devices. In view of Thompson, it would have been obvious to one of ordinary skill in the art to incorporate the process steps of Thompson into the Burnham semiconductor process because a first defect layer is grown [0030, lines 17-20].

30. Pertaining to claim 16, Burnham in view of Thompson fail to teach a method according to claim 1, in which an electron cyclotron resonance system is used to generate a plasma, wherein the microwave power of the ECR system is between 300 and 3000 W, more preferably between 1000 and 2000 W, the process temperature is between 25 and 500^0 C, more preferably between 25 and 200^0 C, the process pressure is between 0. 1 and 100 mtorr, more preferably between 20 and 50 mtorr, and the exposure time is between 30 seconds and 1 hour, more preferably between 4 and 14 minutes.

31. Given the teaching of the references, it would have been obvious to determine the optimum thickness, temperature as well as condition of delivery of the layers involved. See *In re Aller, Lacey and Hall* (10 USPQ 233-237) "It is not inventive to discover optimum or workable ranges by routine experimentation. Note that the specification contains no disclosure of either the critical nature of the claimed ranges or any unexpected results arising therefrom. Where patentability is said to be based upon particular chosen dimensions or upon another variable recited in a claim, the Applicant must show that the chosen dimensions are critical. *In re Woodruff*, 919 f.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Any differences in the claimed invention and the prior art may be expected to result in some differences in properties. The issue is whether the properties differ to such an extent that the difference is really unexpected. *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986)

Appellants have the burden of explaining the data in any declaration they proffer as evidence of non-obviousness. *Ex parte Ishizaka*, 24 USPQ2d 1621, 1624 (Bd. Pat. App. & Inter. 1992).

An Affidavit or declaration under 37 CFR 1.132 must compare the claimed subject matter with the closest prior art to be effective to rebut a prima facie case of obviousness. *In re Burckel*, 592 F.2d 1175, 201 USPQ 67 (CCPA 1979).

32. Claims 10, 11, 12, 13, 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Burnham et al., U.S. Patent Re. 33,274 as applied to claims 1 and 4-9 above, and further in view of Poole et al., U.S. Patent 6,027,989 and Feldman et al., U.S. Patent 6,071,652.

33. Pertaining to claim 10, Burnham discloses a semiconductor process substantially as claimed. However, Burnham fails to teach a method according to claim 1 further comprising the steps of forming a photoresist on the structure and differentially exposing regions of the photoresist in a spatially selective manner in dependence on the degree of quantum well intermixing required, and subsequently developing the photoresist. Poole teaches a method of comprising the steps of forming a photoresist on the structure and differentially exposing regions of the photoresist in a spatially selective manner in dependence on the degree of quantum well intermixing required, and subsequently developing the photoresist. See **FIG. 7** where Poole teaches the steps of forming a photoresist on the structure and differentially exposing regions of the photoresist in a spatially selective manner in dependence on the degree of quantum well intermixing required, and subsequently developing the photoresist. In view of Poole, it would have been obvious to one of ordinary skill in the art to incorporate the process steps of Poole into the Burnham semiconductor process because by varying the thickness different defect concentrations are created in different regions (column 3, lines 11-12). However, Poole fails to

disclose that the mask **12, 14** and **16** above the dielectric is a photoresist. Feldman discloses the use of photoresist. See **FIG. 3**, where Feldman discloses a contact mask with photoresist. In view of Feldman, it would have been obvious to one of ordinary skill in the art to incorporate photoresist into the combined teachings of Burnham and Poole because the photoresist is used to transfer the desired optical element (column 2, lines 41-42).

34. Pertaining to claim 11, the combined teachings discloses a method according to claim 10, comprising the step of applying an optical mask to the photoresist and exposing the photoresist through the optical mask, the optical mask having an optical transmittance that varies in a spatially selective manner.

35. Pertaining to claim 12, the combined teachings discloses a method according to claim 11, in which the optical mask is a Gray scale mask (see title of Feldman).

36. Pertaining to claim 13, the combined teachings discloses a method according to claim 10, in which the photoresist is applied to a masking layer.

37. Pertaining to claim 14, the combined teachings disclose a method according to claim 13, in which the masking layer is a dielectric.

38. Pertaining to claim 15, the combined teachings disclose a method according to claim 13, further comprising the steps of etching the structure with the developed photoresist in situ to provide a differentially etched masking layer.

Double Patenting

39. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686

F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

40. Claim 1 is provisionally rejected under the judicially created doctrine of double patenting over claims 1, 5, 33, 38, 39 and 41 of copending Application No. 09/916,701. This is a provisional double patenting rejection since the conflicting claims have not yet been patented.

The subject matter claimed in the instant application is fully disclosed in the referenced copending application and would be covered by any patent granted on that copending application since the referenced copending application and the instant application are claiming common subject matter, as follows: it is well known in the art to substitute ions for photons to cause intermixing of the quantum well for compound semiconductor devices.

41. Furthermore, there is no apparent reason why applicant would be prevented from presenting claims corresponding to those of the instant application in the other copending application. See *In re Schneller*, 397 F.2d 350, 158 USPQ 210 (CCPA 1968). See also MPEP § 804.

Conclusion

42. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

43. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO

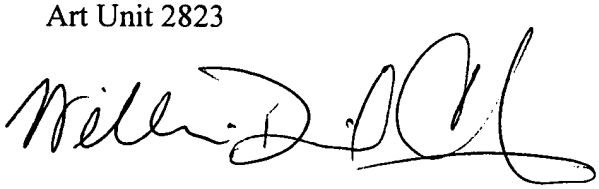
MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

44. Any inquiry concerning this communication or earlier communications from the examiner should be directed to W. David Coleman whose telephone number is 703-305-0004. The examiner can normally be reached on 9:00 AM-5:00 PM.

45. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7721 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

W. David Coleman
Examiner
Art Unit 2823



WDC
April 2, 2003